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TITLE

3D Scanning and Printing in the Production of Personalized Lead Surface Collimation for Treatment of Skin Cancers of the Face

HYPOTHESIS:

The hypothesis is that 3D scanning and printing could improve comfort and reliability in producing metal overlays for treatment of skin cancers of the face.

BACKGROUND/AIMS:

Collimation at the skin surface with a metal overlay provides optimal protection of the normal tissues when treating skin cancers of the face with electron or orthovoltage radiotherapy. The first step in this process is to produce an accurate representation of the patient’s face to act as a mold when shaping the metal overlay. Traditional alginate-pouring methods for this step cause patient discomfort, particularly when surgical wounds are present. We have developed an inexpensive method using modern rapid prototyping equipment to produce personalized metal overlays without physical contact with the patient.

METHODS:

Our department changed our standard of care for production of lead overlays for the face from an alginate-pouring method to 3-dimensional (3D) printing. During the changeover period, both methods were used for each patient in order to verify accuracy and reproducibility of the new 3D printing approach. In a study approved by our IRB, we contacted patients treated for skin cancers during this period to ask them to rate the comfort of the old and new production methods. We also asked physicians who treat these cancers to compare the old and new methods with regard to the quality of equipment they generate.

RESULTS & CONCLUSIONS

Our study population is 11 patients. On a 0 (terrible) to 5 (excellent) scale, patients rated the comfort of the alginate process at a mean of 2.6. One patient had undergone recent rhinectomy and reported intense wound discomfort from the alginate material. All respondents disliked breathing through a tube during the molding process. On average, patients rated the comfort of the 3D scanning process at 4.9. All 11 patients stated that they would choose the 3D scanning and printing method over alginate molding if they were to be treated for a second skin cancer.

Of the 3 local physicians who treat head and neck cancer, all 3 rated the face castings from the 3D printing method as a more accurate representation of the patient’s face. They also indicated that the 3D-printed mold is more durable than the plaster positive mold created by the alginate process.

3D scanning and printing make it possible to create personalized metal overlays for surface collimation in the treatment of skin cancers of the face with minimal patient discomfort. This method was preferred by patients and physicians over the old alginate-pouring techniques.